

6/23, 6/30, 7/7

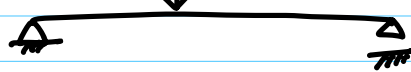
授業 ⇒ オニデマート

10:30 ~ 11:15
at AL

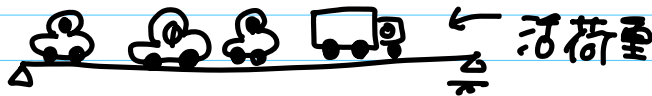
第7回 構力I

↓ 集中荷重

単純ばり



車, トラク, 電車 etc



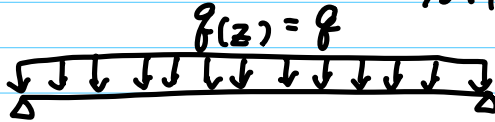
小文字の q

99 Nine

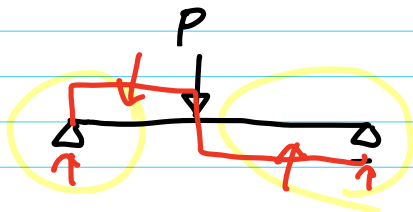
88 8

コンクリート ⇒ 死荷重 ∴

分布荷重

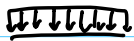


等分布荷重

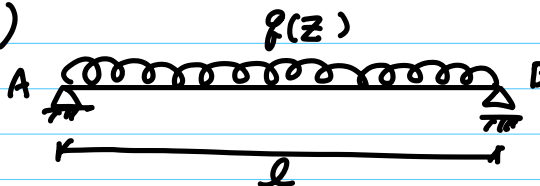


集中荷重 ⇒ 場合わけあり!

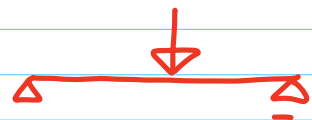
等分布荷重はない!



(例)



No
S回
M回

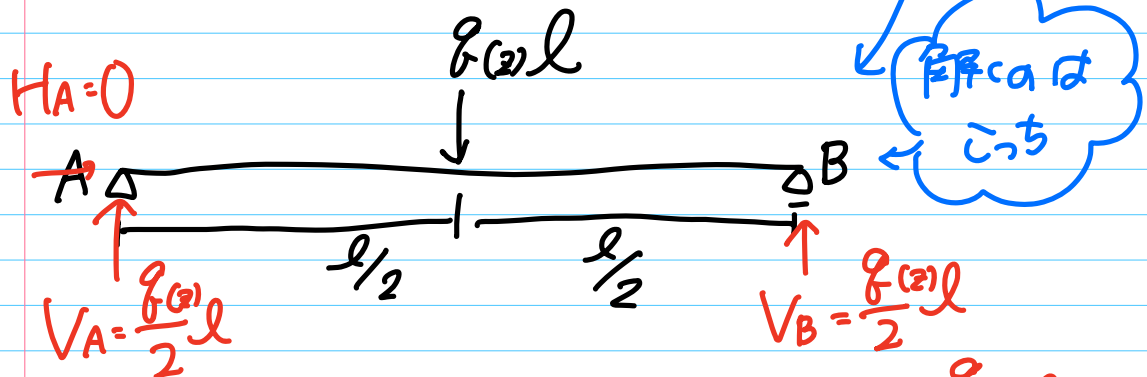
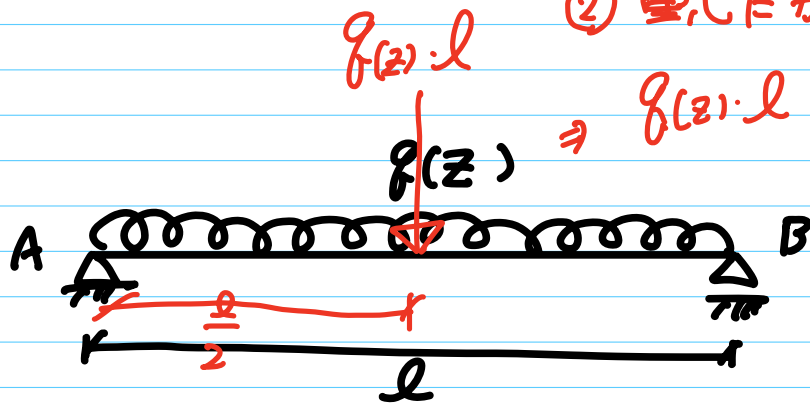


Step 1) 反力を求める

等分布荷重 \Rightarrow 集中荷重にする

① $f(z) \times l$

② 重心にかたす



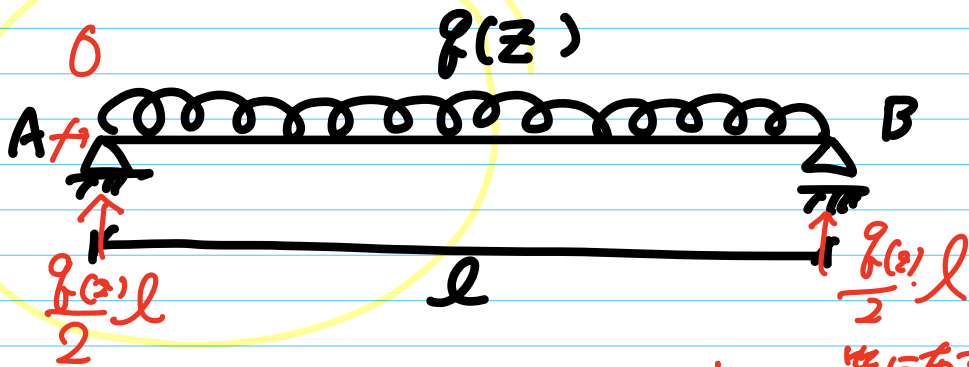
$$\sum F_x = H_A = 0$$

$$\downarrow \sum F_y = -V_A + f(z)l \cdot V_B = 0$$

$$\downarrow \sum M_A = -f(z)l \cdot \frac{l}{2} + V_B \cdot l = 0 \quad V_B = \frac{f(z)l}{2}$$

$$\rightarrow V_A = \frac{f(z)l}{2}$$

Step 2) 内力を見よ

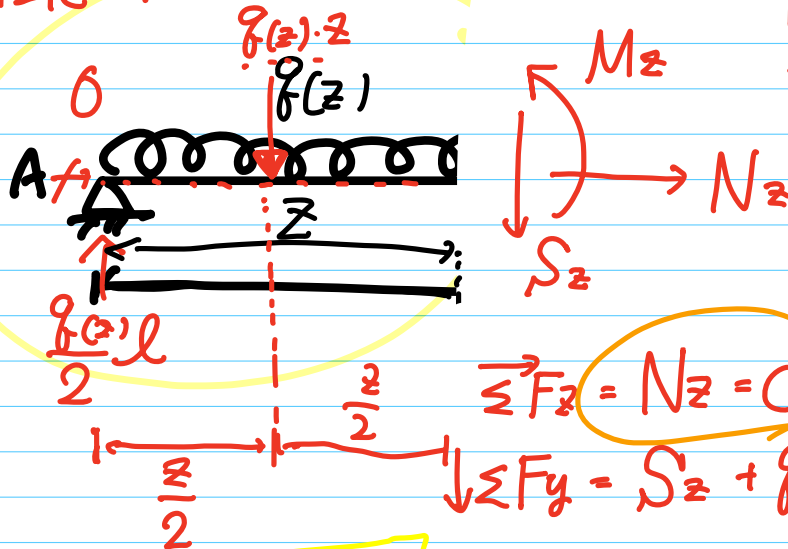


新たに等分布荷重を

$$f(z) \cdot z$$

集中荷重にする。

任意の点で切る。



$$\sum F_x = N_z = 0$$

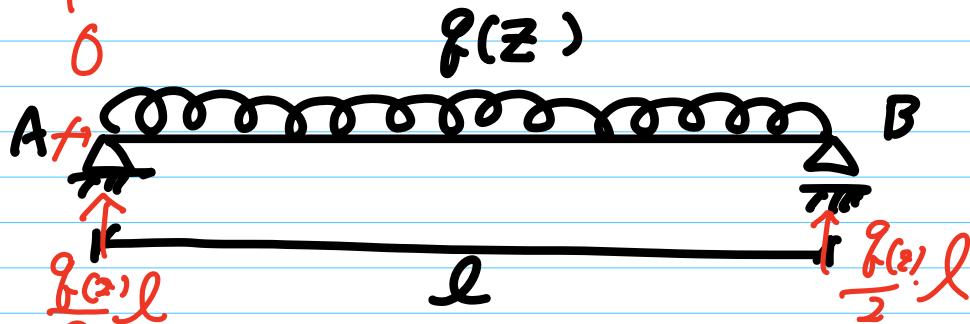
$$\sum F_y = S_z + f(z)z - \frac{f(z)l}{2} = 0$$

$$\begin{aligned} \sum M_z &= M_z + f(z)z \cdot \frac{z}{2} \\ &\quad - \frac{f(z)l}{2} \cdot z = 0 \end{aligned}$$

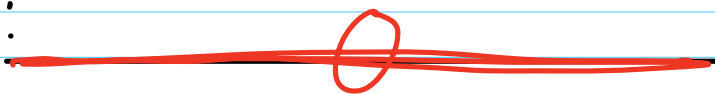
$$\begin{aligned} S_z &= \frac{f(z)l}{2} - f(z)z \\ &= \frac{f(z)}{2} (l - 2z) \end{aligned}$$

$$M_z = \frac{f(z)l}{2} \cdot z - \frac{f(z)}{2} z^2 = \frac{f(z)}{2} (lz - z^2)$$

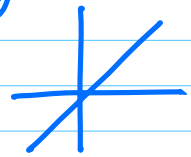
Step 3)



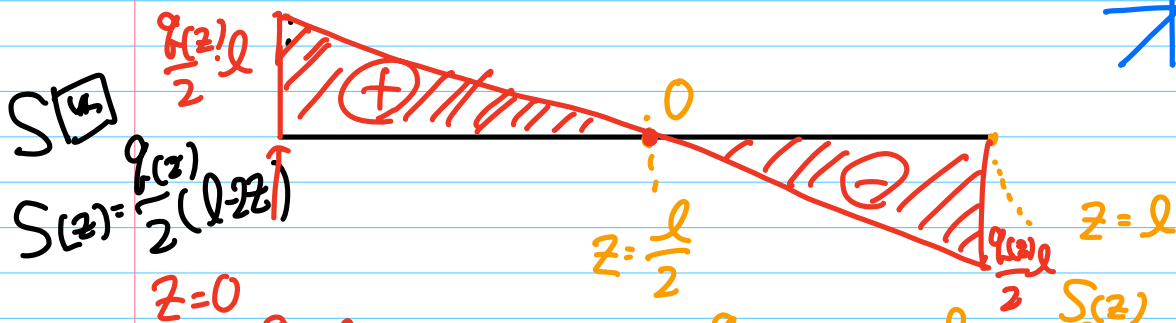
N



$$y = ax$$



S



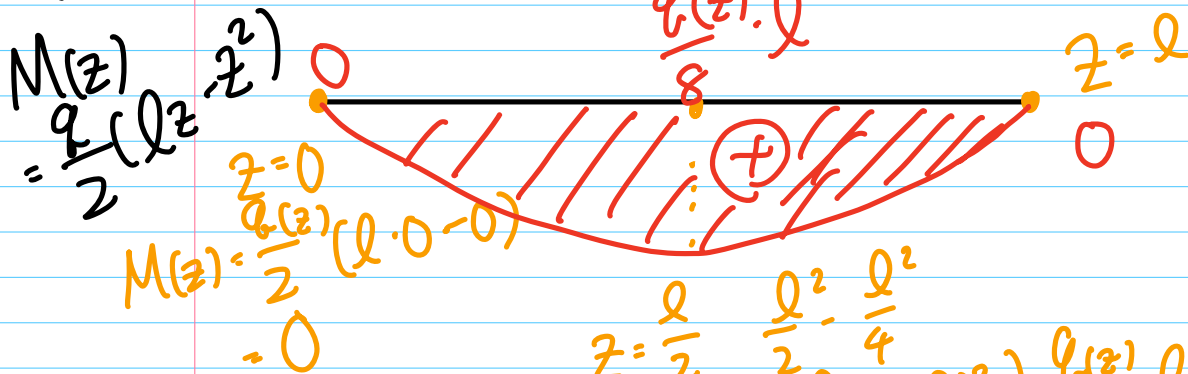
$$S(z) = \frac{q(z)}{2}(l - 2z)$$

$$z=0 \quad S(z) = \frac{q(z)}{2}(l - 0) = \frac{q(z)l}{2}$$

$$z = \frac{l}{2} \quad S(z) = \frac{q(z)}{2}(l - 2 \cdot \frac{l}{2}) = 0$$

$$z=l \quad S(z) = \frac{q(z)}{2}(l - 2l) = -\frac{q(z)l}{2}$$

M



$$M(z) = \frac{q}{2}(lz - z^2)$$

$$z=0 \quad M(z) = \frac{q(z)}{2}(l \cdot 0 - 0) = 0$$

$$z = \frac{l}{2} \quad \frac{l^2}{2} - \frac{l^2}{4} = \frac{l^2}{4}$$

$$M(z) = \frac{q(z)}{2}(l \cdot \frac{l}{2} - (\frac{l}{2})^2) = \frac{q(z)}{8} \cdot l^2$$

$$M(z) = \frac{q(z)}{2} (lz - z^2) \leftarrow$$

$$M(z) = \frac{q(z)}{2} \cdot lz - \frac{q(z)}{2} \cdot z^2$$

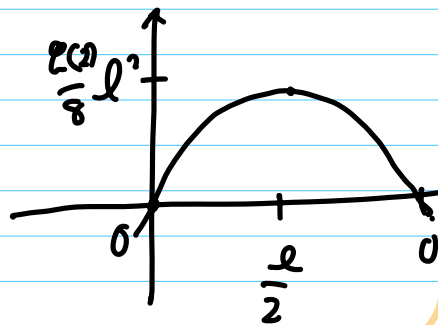
$$M'(z) = \frac{q(z)}{2} l - q(z) \cdot z$$

$$= -q(z) \cdot z + \frac{q(z)}{2} l$$

$$q(z) \cdot z = \frac{q(z)}{2} l$$

$$z = \frac{l}{2}$$

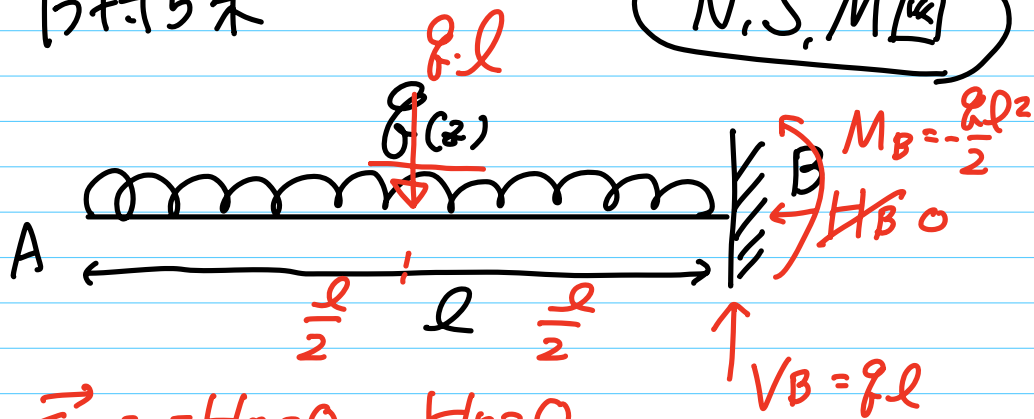
z	0	$\frac{l}{2}$	l
M'	↗	0	↘
M	0	$\frac{q(z)}{8} l^2$	0



$q(z)$
↓
q

例2) 片持ち梁

N, S, M

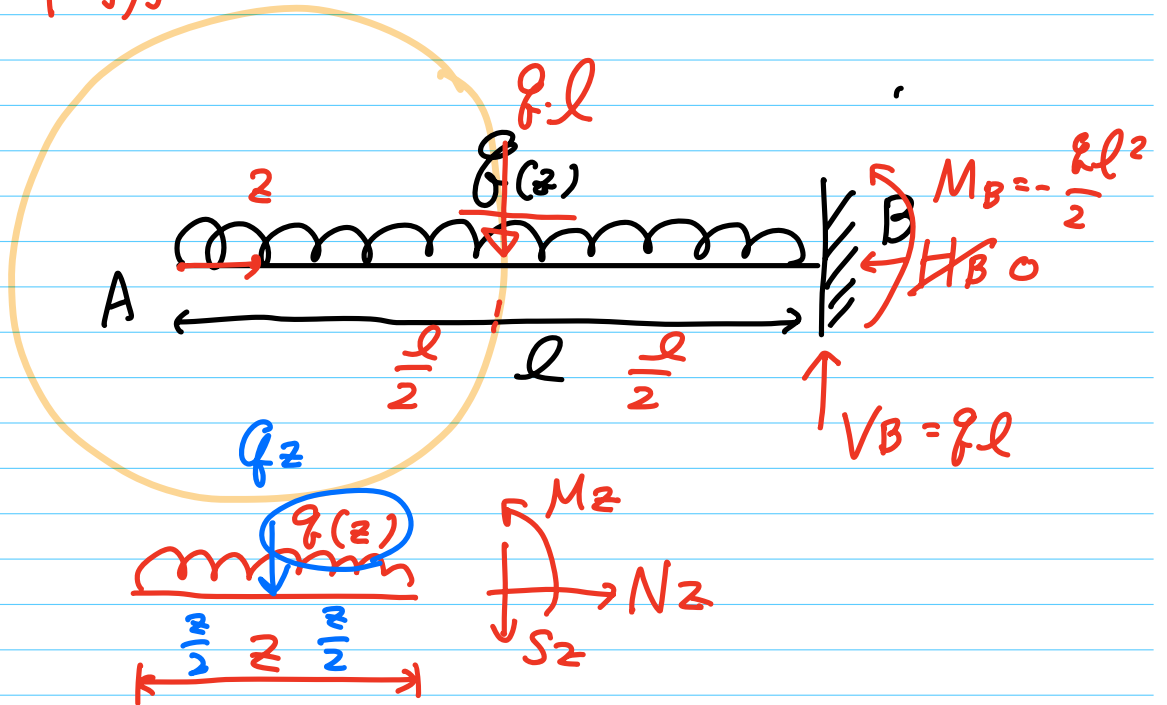


$$\text{反力) } \sum z = -H_B = 0 \quad H_B = 0$$

$$\downarrow \sum F_y = ql - V_B = 0 \quad V_B = ql$$

$$\sum M_B = M_B + ql \cdot \frac{l}{2} = 0 \quad M_B = -\frac{ql^2}{2}$$

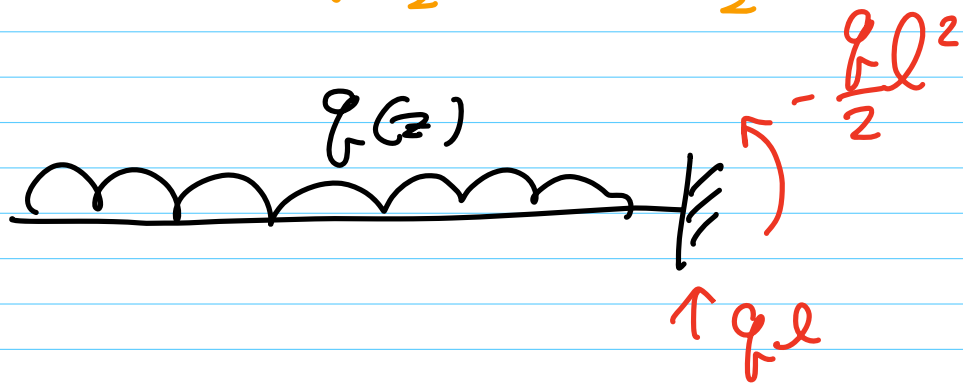
内力



$$\sum F_z = 0 \quad N_z = 0$$

$$\downarrow \sum F_g = qz + S_z = 0 \quad S_z = -qz$$

$$\downarrow \sum M_z = -M_z + qz \cdot \frac{z}{2} = 0 \quad M_z = -\frac{qz^2}{2}$$

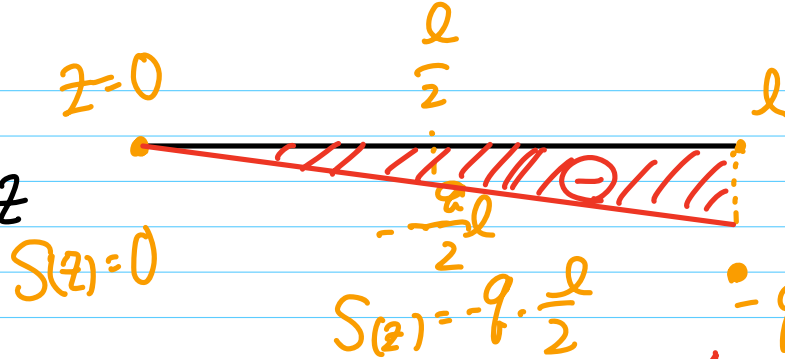


N



$S(x)$

$$S(z) = -qz$$



$M(x)$

$$M(z) = -\frac{q}{2}z^2$$



$$M(z) = -\frac{q}{2}\left(\frac{l}{2}\right)^2 = -\frac{ql^2}{8}$$

$$M(z) = -\frac{q}{2}l^2$$